

Remarks:

Reconsideration of the application is requested.

Claims 1-5 and 11-25 are now in the application. Claims 11-12 and 18 have been withdrawn from consideration. Claim 25 has been added.

In item 4 on page 3 of the above-identified Office action, claims 1-5 and 13-17, and 19-24 have been rejected as being obvious over *Akagawa et al.* (EP 0 734 059) in view of *Farnworth et al.* (US 6,639,600), *Akram et al.* (US 6,107,109), and *IBM Technical Bulletin*, "Solder Plated Resin Ball", Vol. 38, pages 463-464 (May 1995) under 35 U.S.C. § 103.

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 (similarly claim 3) calls for, inter alia:

said thickness of said second insulating layer, said elasticity of said conductive material, and said

elasticity of said small balls **resulting in a desired mechanical decoupling** from a printed circuit board upon the semiconductor component being soldered onto the printed circuit board.

In item 4 on pages 3 and 4 of the Office action, the Examiner stated that:

Akagawa et al are directed to a chip sized semiconductor device and a process for making it comprising providing chips (32), placing electrical connection pads on the chip (36), applying a first insulating layer (38) such that the electrical connection pads are left partially uncovered, producing interconnects (40) on the first insulating film leading from the electrical connection pads (36) to a base region (43) of external connection elements; applying a second insulating layer (42) on the interconnects and the first insulating layer that is thicker than the first insulating layer; forming openings (44) in the second insulation layer above the base regions; and placing solder balls (46) in the openings and attaching them to the base regions. Akagawa et al are silent towards the balls being plastic balls having a metallic coating.

It is well known and conventional in the semiconductor art to use plastic balls having a metallic coating and an outer solder coating in place of pure solder balls because the plastic is more reliable to withstand thermal stress, as shown for example in IBM Technical Bulletin, "Solder Plated Resin Ball" page 463. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the resin ball of the IBM Technical Bulletin in the method and product of Akagawa et al in order to increase resistance to thermal stress.

Akagawa et al are also silent towards bonding the balls to the base region by placing a conductive material in the opening and attaching the ball to the connection pads via the conductive material. Akagawa et al teach bonding the solder ball to the base region through a reflow process (Column 9, line 3). It is well known and conventional to use conductive material, such as conductive adhesive, to attach balls to a surface in place of a reflow process, as shown for example in Famworth et al (Column 11, lines 61-64) and Akram et al (Column 7, lines 43-45). The two are alternative

expedients and it would have been obvious to use either and only the expected results would be achieved. **It would have been obvious to one of ordinary skill in the art at the time the invention was made to place conductive material in the opening and attach a resin ball coated with metal to the base region via the conductive material** in the method and product of the Akagawa et al.

It is also noted that **one skilled in the art would have readily appreciated** that the product derived from the method of Akagawa et al, as modified above, **would be capable** of being soldered to a printed circuit board **and of being mechanically decoupled** from the printed circuit board.

(emphasis added)

In the last paragraph on page 4 of the Office action

(reproduced above), the Examiner merely stated regarding the issue of decoupling "one skilled in the art would have readily appreciated that the product derived from the method of Akagawa et al, as modified above, would **be capable** of ... being mechanically decoupled from the printed circuit board."

(emphasis added). No reference is applied which would suggest any one of the factors recited in the claims for obtaining a desired mechanical decoupling.

Furthermore, as discussed in MPEP § 2112, a limitation recited in a claim that is not expressly or implicitly disclosed in a prior art reference is inherently disclosed therein if, and only if, the "missing" limitation is *necessarily* present in the prior art, and that it would be so recognized by persons of ordinary skill. The principles of inherency require that

the inherency be absolute, and not probabilistic. As far as Applicants were able to ascertain, there is no disclosure or suggestion in Akagawa et al. that it is **absolutely necessary** that "the product derived from the method of Akagawa et al.", as modified by the Examiner, "would be capable of ... being mechanically decoupled [as desired] from the printed circuit board" as asserted by the Examiner.

As stated in Applicants' response dated January 13, 2003, the inventive concept of the invention of the instant application is to use a particular combination of (i) thickness of an insulating layer, (ii) elasticity of a conductive material, and (iii) elasticity of small balls in order to achieve a desired mechanical decoupling of a semiconductor component from a printed circuit board when the semiconductor component is soldered onto the printed circuit board. None of the references suggest using such a particular combination of variables to achieve a desired mechanical decoupling from a printed circuit board when a semiconductor component is soldered onto the printed circuit board. None of the references is concerned with the decoupling of a semiconductor component from a printed circuit board. Without a conceptional or functional realization (in other words: "some suggestion or motivation to combine the references" with "a reasonable expectation of success") of this inventive concept,

the present invention cannot be obvious over the applied references.

MPEP § 2143 (8<sup>th</sup> edition, 1st revision) states:

**2143 Basic Requirements of a *Prima Facie* Case of Obviousness**

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Hence, in order to establish a *prima facie* case of obviousness by modifying or combining reference teachings, MPEP § 2143 requires that:

- there must be ***some suggestion or motivation*** to combine the references in the prior art;
- there must be a ***reasonable expectation of success*** to be found in the prior art; and
- the prior art references must teach or suggest ***all*** the claim limitations.

It is therefore believed that the Examiner has not satisfied any one of the three criteria for establishing a *prima facie* case of obviousness by modifying or combining reference teachings, as required by MPEP § 2143.

It is accordingly believed to be clear that the references do not suggest the features of claims 1 and 3. Claim 1 is, therefore, believed to be patentable over the art and because claims 2, 4-5, and 11-25 are ultimately dependent on either claims 1 or claim 3, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-5 and 11-25 are solicited.

If an extension of time is required, petition for extension is herewith made.

Please charge any fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

  
Markus Nolf (Reg. No. 37,006)

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Lerner and Greenberg, P.A.  
Post Office Box 2480  
Hollywood, FL 33022-2480  
Tel: (954) 925-1100  
Fax: (954) 925-1101